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(54) **Movable video camera for surveillance**

Bewegbare Videokamera zur Überwachung

Caméra vidéo mobile pour la surveillance

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(56) References cited:
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Description

FIELD OF THE INVENTION

The present invention relates to a movable watch camera apparatus, and more particularly to, a camera apparatus in which a series of control programs control a video camera recorder so as to move it automatically along a rail of a certain track contour and to perform photographings, and a series of the photographings are recorded, thereby making it possible to guard a certain area with a single camera.

BACKGROUND OF THE INVENTION

Generally, many public facilities such as banks, department stores and prisons are guarded by patrolling cars at intervals of certain periods. However, such a guarding method is not efficient enough to prevent or detect crimes and other accidents.

Such a guarding method depends on human efforts and, therefore, the carelessness and mistakes of the patrolling persons can fail to notice the objects. Thus, an intruder who well knows the situation of the watched area can escape the detection of the patrolling persons. Consequently, many accidents are still generated and the lost of property is brought about.

In order to overcome the above described problems of the human watch method, there is recently developed a new guarding and security system described below. That is, there is used a closed circuit which is provided with a camera and the like for detecting objects and a monitor capable of displaying the area to be watched so as to take a quick warning and action as soon as an accident such as an intruding or a fire is happened.

However, such a guarding system requires a large number of cameras to be installed at the critical places corresponding to the area to be watched. Therefore, the need for such a large number of cameras causes the total cost of the guarding system to be increased, and further, there is also required an expensive recording apparatus for recording the data photographed by the watching cameras as well as a plurality of video tapes, thereby imposing a high financial load to the user of the guarding system.

SUMMARY OF THE INVENTION

The present invention is intended to overcome the above described disadvantages of the conventional apparatus.

Therefore, it is the object of the present invention to provide a movable watch camera according to Claim 1 in which a control program controls a single or small number of cameras so as to automatically move them along a rail track, thereby making it possible to guard a whole area. Such a movable watch camera apparatus is already known from FR-A-2633134.

In achieving the above object, the movable watch camera according to the present invention comprises a MICOM (microcomputer) for controlling the whole system and for controlling the motion of a watch camera on the basis of a control program in response to an input path information, a path input section for inputting the moving path information for the watch camera to the MICOM, a sensing section for selectively turning on or off respective sensors disposed on a rail according to the path commands from the MICOM, a sensor detecting section for detecting the moving path of the watch camera by sensing the states of the sensors of the sensing section, a camera VCR (Video Cassette tape Recording) section including a watch camera for photographing the guarding area by moving through the area along the rail according to the path commands from the MICOM and a VCR for recording intermittently or continuously the photographed information of the watch camera, and a main driving section for supplying a driving power to the camera VCR section and for driving and shifting the moving direction of the watch camera according to the output of the sensor detecting section.

BRIEF DESCRIPTION OF THE DRAWINGS

The above object and other advantages of the present invention will become more apparent from the description of the preferred embodiment of the present invention with reference to the attached drawings in which:

Fig.1 is a block diagram showing the constitution of the movable watch camera apparatus according to the present invention;

Fig.2 illustrates the constitutions of the rail and video camera recorder of the movable watch camera apparatus according to the present invention;

Fig.3 illustrates the installation of the rail of the movable watch camera apparatus according to the present invention;

Fig.4 is a flow chart showing the operation of the movable watch camera apparatus according to the present invention; and

Fig.5 is a flow chart showing the operation of the recording mode in Fig.4.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Fig.1 is a block diagram showing the constitution of the movable watch camera apparatus according to the present invention. As shown in Fig.1 a MICOM 10 controls the whole system on the basis of control programs, and the output terminal of a path inputting section 20 which inputs moving paths of the camera is connected

to the MICOM 10. The MICOM 10 is connected to a sensing section 30, and the sensing section 30 turns on or off a plurality of sensors 31 which are installed at certain intervals on the rail.

The outputs of the sensing section 30 are detected by a sensor detecting section 40, and the outputs of the sensor detecting section 40 are supplied to a main driving section 60 for driving a motor. The main driving section 60 turns on or off a camera VCR section 50. The camera VCR section 50 records the photographed data for the area to be guarded. The main driving section 60 drives the camera VCR section 50 and a motor for moving the camera in the forward or reverse direction.

Fig.2 illustrates an embodiment of the mechanism of the movable watch camera apparatus according to the present invention. As shown in Fig.2, a mounting pole 52 for the watch camera (video camera recorder) 51 is provided with sensor detecting means which is installed at the lower part thereof thereby forming the sensor detecting section 40 as shown in Fig.1.

Further, sensors 31 of the sensing section 30 are installed on the inner bottom of a rail 70 in such a manner that the sensors 31 and the sensor detecting section 40 of the mounting pole 52 should face each other. Further, a plurality of driving gears 53 are installed on the tower part of the mounting pole 52, and spur gears 71 are formed on the opposite sides of the rail 70 so as to be meshed with the driving gears 53, whereby roving the driving gears 53 along with the spur gears 71 of the rail 70.

Fig.3 illustrates such an installed state of the rail 70. As shown in Fig.3, a plurality of sensors 31 are respectively installed between points a - h.

In the case where such a track is adopted, the moving paths for the watch camera 51 can be varied as follows.

Path 1: points a--b--c--d--e--a

Path 2: points a--e--f--e--d--g--h

.
.
.

Path N: points a--b--c--d--g--h--g--d--c--b--a

Therefore, the moving paths for the watch camera 1, 2, 3, ... N are selectively inputted into the MICOM 10 and, thus, the paths for the watch camera 51 are succeeded in accordance with the sequence of the programs of the MICOM 10.

The camera apparatus of the present invention constituted as above will now be described as to its operations and effects referring to Fig.4.

At the start, the MICOM 10 decides as to whether there is an input for the path from the path input section 20 (step 110) so that in the absence of such an input, the camera 1 is led to its usual moving loop which is set in advance (step 120). On the other hand, in the presence of such an input, the input of the path input section 20 applied to the MICOM 10 (step 130) so that the MICOM 10 controls the sensing section 30 according to the input so as to turn on or off the sensors 31 installed on the rail 70 respectively and to move the watch camera 51 along the inputted path (step 140).

Thereafter, the MICOM 10 drives the main driving section 60, so that the camera VCR section 50 is turned on, and that the watch camera 51 is activated to perform photographings. At the same time, the motor is driven so as to move the watch camera 51 (step 150), and the data photographed by the watch camera 51 is recorded by its VCR section (step 160). As shown in Fig.2, the watch camera 51 moves along the rail 70 by a plurality of the driving gears 53 which are driven by a motor (not shown) and meshed with the spur gear 71 formed on the rail 70.

Under this condition, whether the watch camera 51 should continuously move or should change the track is decided in accordance with the states of the sensors 31 installed on the rail 70, i.e., the turned on or off states of the sensors 31. The states of the sensors 31 are controlled by the MICOM 10 in accordance with the path information inputted from the path input section 20.

Further, when the watch camera 51 passes the sensors 31, if the mounting pole 52 of the camera is positioned vertically upon the sensors 31, the sensor detecting section 40 installed on the lower part of the mounting pole 52 generates a sensing signal to read a track changing signal. Then the main driving section 60 drives the motor in the forward or reverse direction for adjusting the moving direction of the watch camera 51.

In that case, the sensor detecting means utilizes a F/V converter (frequency-to-voltage converter) to make the respective sensor 31 of the sensing section 30 generate commands for straight advancement, left and right turns and reverse advancement in different frequencies. At the same time, the sensor detecting section 40 detects the frequencies outputted from the sensors 31, and supplies them as data for the motion of the camera.

Furthermore, when the camera comes to the position directly above a sensor 31 which generates direction changing signals, the signals are detected by means of a proximity switch. Some other techniques which are not described in the present invention might be used.

Thus, the watch camera 51 moves along the inputted moving paths, takes photographs, and records the photographed data, until arriving at the end of the rail 70, where a discrimination is made as to whether the camera 51 has arrived at the end of the rail (step 170), and then the movement of the watch camera 51 is reversed in the opposite direction (step 180).

If the discrimination shows that it has not arrived at the end of the rail 70 yet, the watch camera 51 continuously move and, thereafter, the discrimination is made again as to whether it has arrived at the end of the path (step 190). If it is not the end of the path, a return to the step 170 is made to carry out the step again, while, if it

is the end of the path, a return is made to the step 110 where a discrimination is made as to whether a new path is to be inputted.

According to the result of the discrimination, if there is no new path input the preset normal state (step 120) is restored, and if there is a new path input, then the steps from 130 to 190 are repeated.

Meanwhile, the normal state can be selectively set by the user, for example, one of the above mentioned paths is carried out or the driving of the whole system can be terminated in the normal state.

Thus, if the moving paths for the watch camera 51 are set by the path input section 20 in advance, the watch camera 51 moves to carry out the steps successively in accordance with the sequence of the inputted paths (inputted into the MICOM 10) and, therefore, it becomes impossible for a third party to predict the moving direction of the camera.

Moreover, in the case where the guarding area is very extensive, the recording can be carried out intermittently at a predetermined interval during the movement of the watch camera, so that then the consumption of the recording tape can be saved.

If the recordings are intermittenly made, the recording-on and recording-off times should be set at the step 160 under the recording mode as shown in Fig.4.

That is, in setting the recording times as shown in Fig.5, the recording on-and-off times are set (step 161), and the recording mode is turned on to record the photographed data of the watch camera 51 on the tape (step 162). Then a discrimination is made as to whether the recording-on time has elapsed off (step 163). If it is found that the recording-on time has not been elapsed yet, then the mode of recording-on is maintained further while checking the elapse thereof.

If the recording-on time has elapsed off, the recording mode is turned off (step 164), so that the photographed data of the watch camera 51 is not be recorded any more and the user can guard only through the monitor.

According to the present invention as described above, the watch camera moves along the rail of a predetermined track contour to extensively watch the area to be guarded. Further, the moving paths for the watch camera for taking the photographs are variously provided so that all the corners of the place to be guarded can be watched without omissions, and that more important places can be more frequently watched by adjusting the paths.

Accordingly, the present invention eliminates the waste of the human efforts in comparison with the case of alternate patrollings by the patrolling guards at a certain interval, and even a wide area can be guarded efficiently by means of a single camera or a small number of cameras, thereby the apparatus being economically operated.

Also, the guarding errors due to the carelessness and mistakes of the patrols can be prevented sufficiently.

Furthermore, if the watch camera is provided to pivot left and right, then the watch is not limited to one direction during the movement of the watch camera, but extended to all directions, thereby doubling the guarding effect.

Claims

1. A movable watch camera apparatus comprising:

   a microcomputer (10) for controlling the whole apparatus and for controlling the motion of a watch camera (51) on the basis of control programs in accordance with inputted moving path information;
   a path input section (20) for inputting into said microcomputer (10) the moving path intormation for said watch camera;
   a sensing section (30) including a plurality of fixed sensors (31) which generate commands controlling the moving direction of said camera, said sensors are installed on a rail (70) and are controlled by path commands of said microcomputer (10);
   a sensor detecting section (40) located on the mobile part of said movable watch camera apparatus supporting said watch camera for detecting the moving path of said watch camera by sensing the state of the one of said sensors of said sensing section which is at the location of said mobile part;
   a camera video cassette tape recording section (50) including said watch camera and a video cassette tape recorder;
   said watch camera being for taking photographs over the area to be guarded by moving along said rail; and
   said video cassette tape recorder being for recording the photographed data of said watch camera intermittently or continuously in accordance with the controls of said microcomputer (10); and
   a main driving section (60) for supplying driving power to said camera video cassette tape recording section, and for driving said watcn camera or changing the moving direction of said watch camera (51) according to the output of said sensor detecting section (40).

2. The movable watch camera apparatus as claimed in claim 1, wherein the control program of said microcomputer (10) comprises the steps of:

   discriminating as to whether an input for the roving path of said watch camera is inputted;

   returning to a preset normal state in the absence of the path input;

setting the operations of said sensors of said sensing section, and driving a motor and said watch camera in the presence of the path input;

carrying out a recording mode to record photographed data of said watch camera;

discriminating as to whether said watch camera is positioned at the end of said rail after carrying out the recording mode;

reversing the roving direction of said watch camera if said watch camera is positioned at the end of said rail; and

discriminating as to whether said watch camera is positioned at the end of the path after reversing the moving direction.

3. The movable watch camera apparatus as claimed in claim 2, wherein said recording node comprises the steps of:

setting recording-on and recording-off times;

checking the elapse time during the recording-on time after turning on the recording mode; and

turning off the recording mode when the recording-on time elapsed and turning on the recording mode to repeat after the recording-off time elapsed.

4. The movable watch camera apparatus as claimed in claim 1, wherein said mobile part comprises sensor detection leans, and camera loving leans including a driving gear (53), said driving gear being installed on the lower part of a mounting pole (52) for mounting said watch camera.

5. The movable watch camera apparatus as claimed in claim 4, wherein said rail (70) comprises a spur gear (71) disposed on said rail to be meshed with said driving gear (53) of said mounting pole (52).

6. The movable watch camera apparatus as claimed in claim 4, wherein said rail is provided with a plurality of the said sensors (31) in a predetermined interval on the inner bottom thereof.

7. The movable watch camera apparatus as claimed in claim 4, wherein said sensor detecting means utilizes a frequency to voltage converter.

8. The lovable watch camera apparatus as claimed in claim 4, wherein said sensor detecting means comprises a proximity switch.

Patentansprüche

1. Bewegbares Überwachungskameragerät, das aufweist:

einen Mikrocomputer (10) zum Steuern des gesamten Geräts und zum Steuern der Bewegung einer Überwachungskamera (51) auf der Basis der Steuerprogramme gemäß den eingegebenen Bewegungspfadinformationen;

einen Pfadeingabeabschnitt (20) zum Eingeben in den Mikrocomputer (10) der Bewegungspfadinformationen für die Überwachungskamera;

einen Fühlabschnitt (30), der eine Vielzahl fester Sensoren (31) umfaßt, die Befehle erzeugen, die die Bewegungsrichtung der Kamera steuern, wobei die Sensoren auf einer Schiene (70) installiert sind und durch die Pfadbefehle des Mikrocomputers (10) gesteuert werden;

einen Sensorermittlungsabschnitt (40), der auf dem mobilen Teil des bewegbaren Überwachungskameragerätes, das die Überwachungskamera trägt, angeordnet ist, zur Ermittlung des Bewegungspfads der Uberwachungskamera durch Fühlen des Zustands des einen der Sensoren des Fühlabschnitts, der an der Stelle des mobilen Teils ist;

einen Kamera-Video-Kassettenband-Aufzeichnungsabschnitt (50), der die Überwachungskamera und einen Video-Kassettenbandrecorder umfaßt;

wobei die Überwachungskamera zum Aufnehmen von Photographien über den Flächenbereich, der überwacht werden soll, durch Bewegen entlang der Schiene dient; und

wobei der Video-Kassettenbandrecorder zur Aufzeichnung der photographierten Daten der Überwachungskamera intermittierend oder kontinuierlich gemäß der Steuerung des Mikrocomputers (10) dient, und

einen Hauptantriebsabschnitt (60) zum Zuführen einer Antriebsenergie zu dem Kamera-Video-Kassettenband-Aufzeichnungsabschnitt und zum Antreiben der Überwachungskamera oder zum Ändern der Bewegungsrichtung der Überwachungskamera (51) gemäß dem Ausgang des Sensorermittlungsabschnitts (40).

2. Bewegbares Überwachungskameragerät nach Anspruch 1, wobei das Steuerprogramm des Mikro-

computers (10) die Schritte aufweist:

Diskriminieren, ob eine Eingabe für den Bewegungspfad der Uberwachungskamera eingegeben ist;

Zurückkehren zu einem vorab eingestellten, normalen Zustand bei dem Nichtvorhandensein der Pfadeingabe;

Einstellen der Betriebsweisen der Sensoren des Fühlabschnitts und Antreiben eines Motors und der Uberwachungskamera beim Vorhandensein der Pfadeingabe;

Durchführen eines Aufzeichnungsmodus, um photographierte Daten der Überwachungskamera aufzuzeichnen;

Diskriminieren, ob die Überwachungskamera am Ende der Schiene nach Ausführen des Aufzeichnungsmodus positioniert ist,

Umkehren der Bewegungsrichtung der Überwachungskamera, wenn die Überwachungskamera an dem Ende der Schiene positioniert ist; und

Diskriminieren, ob die Überwachungskamera an dem Ende des Pfads nach einem Umkehren der Bewegungsrichtung positioniert ist.

3. Bewegbares Überwachungskameragerät nach Anspruch 2, wobei der Aufzeichnungsmodus die Schritte aufweist:

Einstellen von Aufzeichnungs-Ein- und Aufzeichnungs-Aus-Zeiten;

Überprüfen der abgelaufenen Zeit während der Aufzeichnungs-Ein-Zeit nach einem Einschalten des Aufzeichnungsmodus; und

Abschalten des Aufzeichnungsmodus, wenn die Aufzeichnungs-Ein-Zeit abgelaufen ist, und Einschalten des Aufzeichnungsmodus, um zu wiederholen, nachdem die Aufzeichnungs-Aus-Zeit abgelaufen ist.

4. Bewegbares Überwachungsgerät nach Anspruch 1, wobei der mobile Teil eine Sensorermittlungseinrichtung und eine Kamerabewegungseinrichtung, die ein Antriebszahnrad (53) umfaßt, aufweist, wobei das Antriebszahnrad auf dem unteren Teil eines Befestigungsstabs (52) zur Befestigung der Überwachungskamera installiert ist.

5. Bewegbares Uberwachungskameragerät nach Anspruch 4, wobei die Schiene (70) ein Stirnzahnrad (71) aufweist, das auf der Schiene so angeordnet ist, daß es mit dem Antriebszahnrad (53) des Befestigungsstabs (52) in Eingriff gebracht ist.

6. Bewegbares Überwachungskameragerät nach Anspruch 4, wobei die Schiene mit einer Vielzahl der Sensoren (31) in einem vorbestimmten Intervall auf dem inneren Boden davon versehen ist.

7. Bewegbares Überwachungskameragerät nach Anspruch 4, wobei die Sensorermittlungseinrichtung einen Frequenz-Spannungs-Wandler verwendet.

8. Bewegbares Überwachungskameragerät nach Anspruch 4, wobei die Sensorermittlungseinrichtung einen Näherungsschalter aufweist.

Revendications

1. Appareil à caméra de surveillance mobile comprenant :

un micro-ordinateur (10) pour commander l'ensemble de l'appareil et commander le mouvement d'une caméra de surveillance (51) selon des programmes de commande en fonction d'informations de trajectoire de déplacement introduites ;

une section d'introduction de trajectoire (20) pour introduire dans ledit micro-ordinateur (10) les informations de trajectoire du déplacement de ladite caméra de surveillance ;

une partie de détection (30) comprenant une pluralité de capteurs fixes (31) qui génèrent des commandes commandant la direction de déplacement de ladite caméra, lesdits capteurs étant installés sur un rail (70) et commandés par des commandes de trajectoire dudit micro-ordinateur (10) ;

une partie de surveillance des capteurs (40) installée sur la partie mobile dudit appareil à caméra de surveillance mobile supportant ladite caméra de surveillance pour détecter la trajectoire de déplacement de ladite caméra en détectant l'état de celui desdits capteurs de ladite partie de détection qui se trouve à l'emplacement de ladite partie mobile ;

une partie (50) d'enregistrement sur bande de cassette vidéo par la caméra comprenant ladite caméra de surveillance et un enregistreur sur bande de cassette vidéo ;

ladite caméra de surveillance étant destinée à prendre des photographies de la zone à surveiller en se déplaçant le long dudit rail ; et

ledit enregistreur sur bande de cassette vidéo étant destiné à enregistrer les données photographiées par ladite caméra de surveillance de façon intermittente ou continue conformément aux commandes dudit micro-ordinateur (10) ; et

une partie principale d'entraînement (60) pour appliquer une énergie d'entraînement à ladite partie d'enregistrement sur bande de cassette vidéo de la caméra, et pour entraîner ladite caméra de surveillance ou changer la direction de déplacement de ladite caméra de surveillance (51) selon la sortie de ladite partie de surveillance des capteurs (40).

2. Appareil à caméra de surveillance mobile selon la revendication 1, dans lequel le programme de commande dudit micro-ordinateur (10) comprend les étapes suivantes :

discriminer si des informations relatives à la trajectoire de déplacement de ladite caméra de surveillance sont introduites ;

revenir à un état normal prédéterminé en l'absence d'informations de trajectoire introduites ;

définir les opérations desdits capteurs de ladite partie de détection, et commander un moteur ainsi que ladite caméra de surveillance en présence d'informations de trajectoire introduites ;

exécuter un mode d'enregistrement pour enregistrer des données photographiées par ladite caméra de surveillance ;

discriminer si ladite caméra de surveillance est placée à l'extrémité dudit rail après exécution du mode d'enregistrement ;

inverser la direction de déplacement de ladite caméra de surveillance si ladite caméra de surveillance est placée à l'extrémité dudit rail ; et

discriminer si ladite caméra de surveillance est placée à l'extrémité de la trajectoire après inversion de la direction du déplacement.

3. Appareil à caméra de surveillance mobile selon la revendication 2, dans lequel ledit mode d'enregistrement comprend les étapes suivantes :

définir des temps d'enregistrement et des temps d'arrêt d'enregistrement ;

vérifier la période écoulée pendant le temps d'enregistrement après lancement du mode d'enregistrement ; et

arrêter le mode d'enregistrement quand le temps d'enregistrement imparti est écoulé et lancer le mode d'enregistrement pour recommencer lorsque le temps d'arrêt d'enregistrement imparti est écoulé.

4. Appareil à caméra de surveillance mobile selon la revendication 1, dans lequel ladite partie mobile comprend des moyens de surveillance des capteurs, et des moyens de déplacement de la caméra comportant un pignon d'entraînement (53), ledit pignon d'entraînement étant installé sur la partie inférieure d'un poteau de montage (52) servant à installer ladite caméra de surveillance.

5. Appareil à caméra de surveillance mobile selon la revendication 4, dans lequel ledit rail (70) comporte un pignon à dentures droites (71) monté sur ledit rail pour s'engrener avec ledit pignon d'entraînement (53) dudit poteau de montage (52).

6. Appareil à caméra de surveillance mobile selon la revendication 4, dans lequel ledit rail est doté d'une pluralité desdits capteurs (31) à intervalles prédéterminés sur sa partie inférieure interne.

7. Appareil à caméra de surveillance mobile selon la revendication 4, dans lequel lesdits moyens de surveillance des capteurs utilisent un convertisseur fréquence-tension.

8. Appareil à caméra de surveillance mobile selon la revendication 4, dans lequel lesdits moyens de surveillance des capteurs comprennent un commutateur de proximité.

FIG . 1

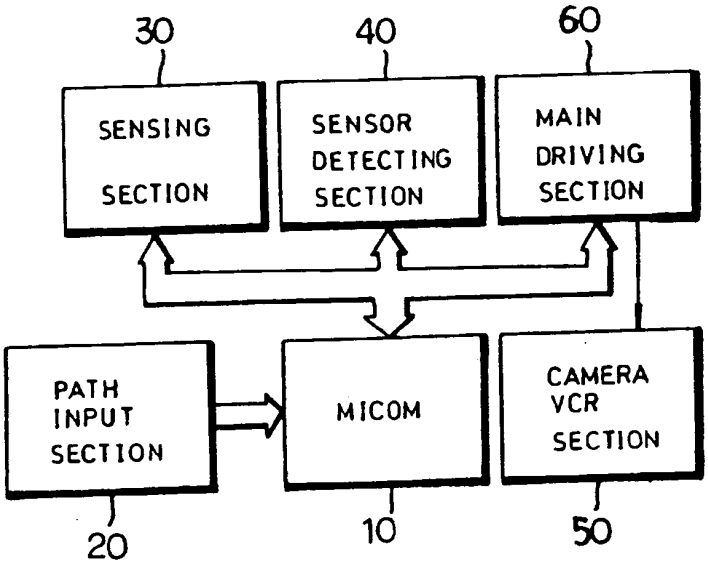

30
40
60
SENSING SECTION
SENSOR DETECTING SECTION
MAIN DRIVING SECTION
PATH INPUT SECTION
MICOM
CAMERA VCR SECTION
20
10
50

FIG . 2

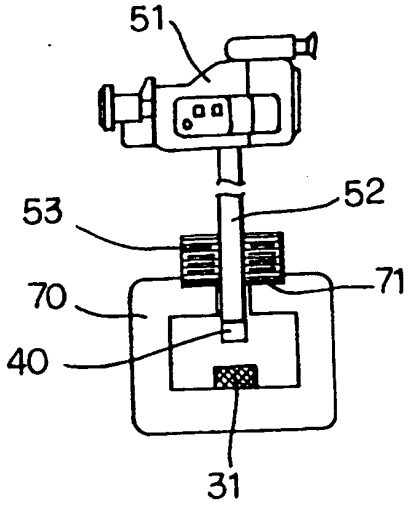

51
52
53
71
70
40
31

FIG. 3

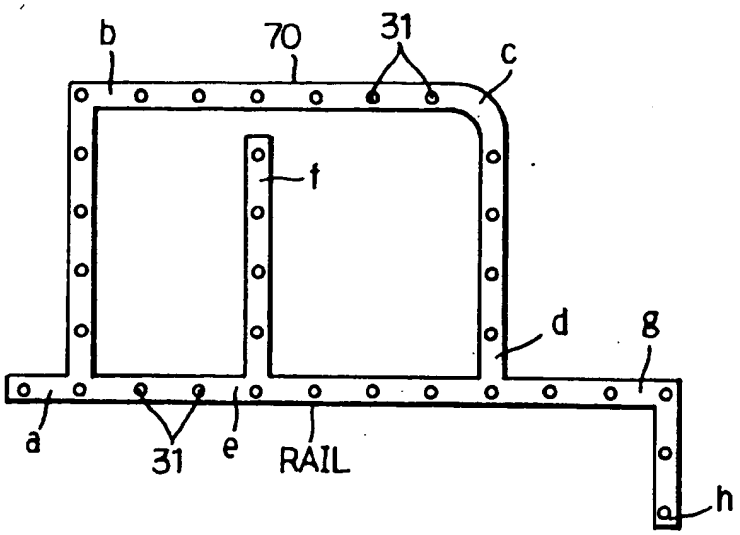

b
70
31
c
f
d
g
a
31
e
RAIL
h

FIG. 5

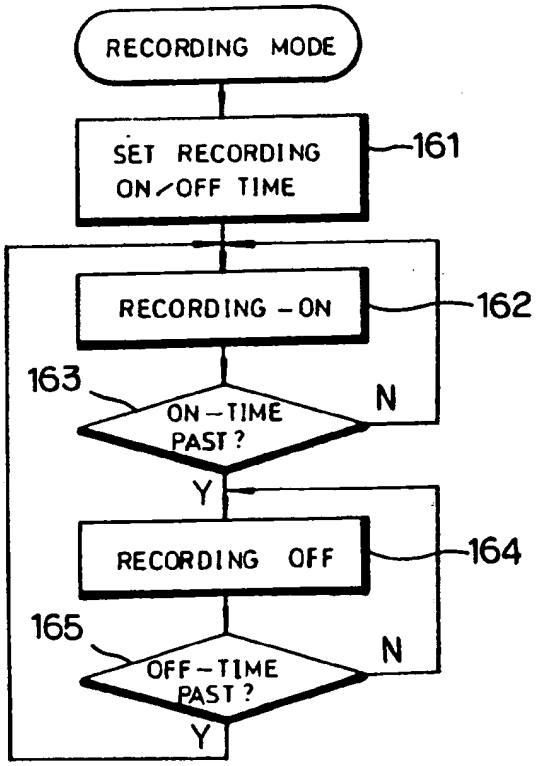
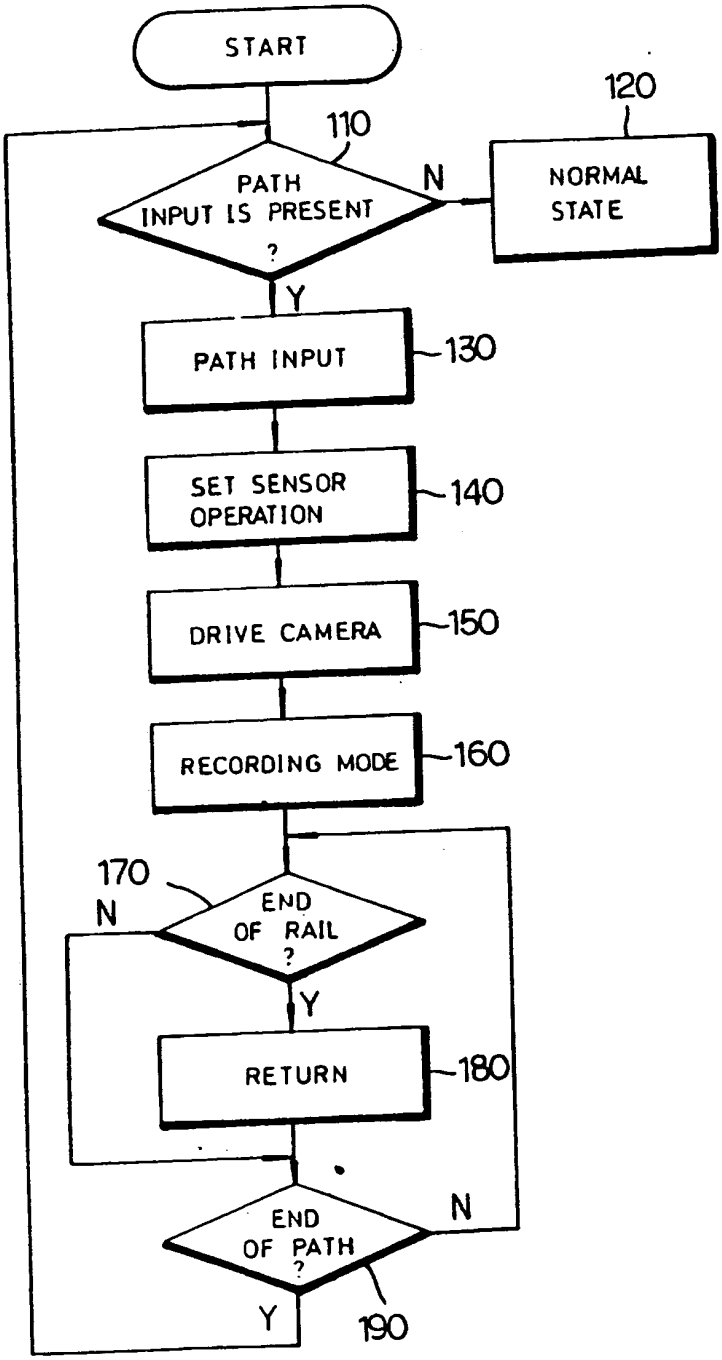

RECORDING MODE
SET RECORDING ON/OFF TIME
161
RECORDING - ON
162
163
ON - TIME PAST ?
N
Y
RECORDING OFF
164
165
OFF - TIME PAST ?
N
Y

FIG. 4


START
110
PATH INPUT IS PRESENT ?
N
120
NORMAL STATE
Y
PATH INPUT
130
SET SENSOR OPERATION
140
DRIVE CAMERA
150
RECORDING MODE
160
170
N
END OF RAIL ?
Y
RETURN
180
END OF PATH ?
N
Y
190